ABSTRACT OF THE DISCLOSURE

Systems and methods are described for an interferometric source of multi-color, multi-beam entangled photons. A method includes: downconverting a beam of coherent energy to provide a beam of multi-color entangled photons; converging two spatially resolved portions of the beam of multi-color entangled photons into a converged multi-color entangled photon beam; changing a phase of at least a portion of the converged multi-color entangled photon beam to generate a first interferometeric multi-color entangled photon beam; and combining the first interferometric multi-color entangled photon beam with a second interferometric multi-color entangled photon beam within a single beamsplitter. An apparatus includes: a multi-refringent device optically coupled to a source of coherent energy, the multi-refringent device providing a beam of multi-color entangled photons; a condenser device optically coupled to the multi-refringent device, the condenser device converging two spatially resolved portions of the beam of multi-color entangled photons into a converged multi-color entangled photon beam; a tunable phase adjuster optically coupled to the condenser device, the tunable phase adjuster changing a phase of at least a portion of the converged multi-color entangled photon beam to generate a first interferometeric multi-color entangled photon beam; and a beam splitter optically coupled to the condenser device, the beam splitter combining the first interferometeric multi-color entangled photon beam with a second interferometric multi-color entangled photon beam.